

**EPA Superfund
Record of Decision:**

**ROCKAWAY BOROUGH WELL FIELD
EPA ID: NJD980654115
OU 02
ROCKAWAY TOWNSHIP, NJ
09/30/1991**

- ! EXTRACTION OF CONTAMINATED GROUNDWATER AND RESTORATION OF THE GROUNDWATER TO DRINKING WATER STANDARDS;
- ! TREATMENT OF EXTRACTED GROUNDWATER TO LEVELS ATTAINING DRINKING WATER STANDARDS;
- ! REINJECTION OF TREATED GROUNDWATER; AND
- ! APPROPRIATE ENVIRONMENTAL MONITORING TO ENSURE THE EFFECTIVENESS OF THE REMEDY.

STATUTORY DETERMINATIONS

THE SELECTED REMEDY IS PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, COMPLIES WITH FEDERAL AND STATE REQUIREMENTS THAT ARE LEGALLY APPLICABLE OR RELEVANT AND APPROPRIATE TO THE REMEDIAL ACTION, AND IS COST-EFFECTIVE. THIS REMEDY UTILIZES PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE AND SATISFIES THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT THAT REDUCES TOXICITY, MOBILITY, OR VOLUME AS A PRINCIPAL ELEMENT. BECAUSE THIS REMEDY DOES NOT ADDRESS THE SOURCES OF THE GROUNDWATER CONTAMINATION, SUBSEQUENT INVESTIGATIONS OF THOSE AREAS WILL BE REQUIRED.

CONSTANTINE SIDAMON-ERISTOFF
REGIONAL ADMINISTRATOR

DATE: 09/30/91

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SITE NAME, LOCATION, AND DESCRIPTION

THE ROCKAWAY BOROUGH WELL FIELD SITE IS LOCATED IN ROCKAWAY BOROUGH, MORRIS COUNTY, NEW JERSEY. THE BOROUGH IS APPROXIMATELY 2.1 SQUARE MILES IN SIZE AND IS BORDERED TO THE NORTH AND WEST BY ROCKAWAY TOWNSHIP AND TO THE EAST AND SOUTH BY DENVILLE TOWNSHIP.

THE ROCKAWAY BOROUGH WELL FIELD SITE IS A MUNICIPAL WELL FIELD SERVING APPROXIMATELY 10,000 PEOPLE. GROUNDWATER IN THE AREA IS CLASSIFIED AS CLASS II-A, A CURRENT SOURCE OF DRINKING WATER. THE BOROUGH'S THREE WATER SUPPLY WELLS (NUMBERS 1, 5, AND 6) ARE IN A GLACIAL AQUIFER DESIGNATED AS A SOLE SOURCE AQUIFER SINCE IT IS THE ONLY VIABLE SOURCE OF DRINKING WATER FOR ROCKAWAY BOROUGH AND THE SURROUNDING COMMUNITIES. THE THREE MUNICIPAL WELLS ARE LOCATED OFF UNION STREET IN THE EASTERN SECTION OF THE BOROUGH. THE MUNICIPAL WELLS RANGE IN DEPTH FROM 54 TO 84 FEET.

THE ROCKAWAY RIVER IS LOCATED APPROXIMATELY 750 FEET SOUTH OF THE CENTER OF THE WELL FIELD, AND BEAVER BROOK, A TRIBUTARY TO THE ROCKAWAY RIVER, IS LOCATED APPROXIMATELY 2,000 FEET TO THE EAST. BOTH THE ROCKAWAY RIVER AND BEAVER BROOK ARE CLASSIFIED AS FW2-NT SURFACE WATER BODIES, INDICATING THAT THEY ARE FRESH WATER WITH NO NATURAL TROUT POPULATION. PRIOR TO DISTRIBUTION, THE GROUNDWATER IS TREATED BY A CARBON ADSORPTION TREATMENT SYSTEM WHICH IS HOUSED NEAR MUNICIPAL WELL NUMBER 5, ALONG WITH THE ROCKAWAY BOROUGH DEPARTMENT OF PUBLIC WORKS GARAGE.

ROCKAWAY BOROUGH IS LOCATED IN NORTHWESTERN NEW JERSEY IN THE BROAD, FLAT VALLEY OF THE ROCKAWAY RIVER, BETWEEN TWO PROMINENT RIDGES. THE EASTERNMOST BOUNDARY OF THE BOROUGH IS NEAR THE CONFLUENCE OF THE ROCKAWAY RIVER AND BEAVER BROOK. LOCAL RELIEF IS APPROXIMATELY 400 FEET ABOVE MEAN SEA LEVEL (MSL). GLACIAL PROCESSES HAVE SHAPED THE SURROUNDING AREA. THE LOCAL BEDROCK WAS SCoured BY GLACIERS INTO NORTHEAST- TO SOUTHWEST-TRENDING RIDGES SEPARATED BY BROAD VALLEYS. LARGE COBBLE AND BOULDER FIELDS ARE PRESENT THROUGHOUT THE AREA AS REMNANTS OF THE WISCONSINAN TERMINAL MORaine.

BEDROCK IS OVERLAIN BY GLACIAL DEPOSITS AND FILL MATERIAL THROUGHOUT MOST OF THE SITE AREA. THESE DEPOSITS VARY IN THICKNESS AND ARE TYPICALLY THICKEST IN THE BEDROCK TROUGHS. IN ADDITION, THE THICKNESS OF THESE DEPOSITS VARIES DEPENDING ON THE PROXIMITY TO THE TERMINAL MORaine WHICH GENERALLY PARALLELS THE ROCKAWAY RIVER.

AN INTERPRETATION OF AVAILABLE SUBSURFACE INFORMATION SHOWS FIVE STRATIGRAPHIC SUBUNITS WITHIN ROCKAWAY BOROUGH. THESE UNITS, IN DESCENDING ORDER, INCLUDE: (1) UNDIFFERENTIATED FILL; (2) A WELL-SORTED SAND AND GRAVEL UNIT WITH COBBLE-RICH HORIZONS; (3) A CLAY AND SILT UNIT; (4) A BOULDER AND COBBLE UNIT WITH ABUNDANT SAND AND GRAVEL; AND (5) BIOTITE GNEISS, GRANITE AND/OR DIORITE BEDROCK. DURING THE FIELD INVESTIGATION, A CLAY UNIT WAS NOT OBSERVED AT ANY OF THE NEWLY INSTALLED SOIL BORINGS OR MONITORING WELL LOCATIONS, ALTHOUGH OTHER ENVIRONMENTAL INVESTIGATIONS CONDUCTED UNDER NEW JERSEY'S ENVIRONMENTAL CLEANUP RESPONSIBILITY ACT (ECRA) INDICATED THAT A CLAY/SILT CONFINING UNIT IS PRESENT IN THE NORTHEAST PORTION OF THE SITE.

REGIONAL GROUNDWATER FLOW WITHIN THE GLACIOFLUVIAL AQUIFER IS IN AN EASTERLY TO SOUTHEASTERLY DIRECTION. THE MUNICIPAL PRODUCTION WELLS HAVE A DIRECT EFFECT UPON GROUNDWATER ELEVATIONS, DIRECTION, AND FLOW PATTERNS WITHIN SELECT PORTIONS OF THE BOROUGH. MUNICIPAL PUMPING WELL NUMBER 6 IS THE PRIMARY PRODUCTION WELL OF THE BOROUGH, WITH ADDITIONAL QUANTITIES OF WATER BEING PUMPED FROM NUMBER 5 AND NUMBER 1. GROUNDWATER WITHIN THE AREA OF INFLUENCE OF THE MUNICIPAL PUMPING WELLS WILL FLOW AT VARIOUS RATES TOWARDS THESE WELLS. THE RATE OF FLOW IS PROPORTIONAL TO THE HYDRAULIC CONDUCTIVITY, HYDRAULIC GRADIENT, POROSITY OF THE AQUIFER AND THE PUMPING RATES OF THE MUNICIPAL PRODUCTION WELLS.

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SITE HISTORY AND ENFORCEMENT ACTIVITIES

INVESTIGATIONS, CONDUCTED BY THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY (NJDEPE) AT THE ROCKAWAY BOROUGH WELL FIELD SITE SINCE 1980, INDICATED THE PRESENCE OF VOLATILE ORGANIC COMPOUNDS (VOCs), PRIMARILY TRICHLOROETHYLENE (TCE) AND TETRACHLOROETHYLENE (PCE) IN THE GROUNDWATER. OTHER INVESTIGATIONS THAT WERE CONDUCTED SINCE 1985 AT SEVERAL INDUSTRIAL FACILITIES IN ROCKAWAY BOROUGH, UNDER ECRA AND OTHER PROGRAMS, HAVE IDENTIFIED SEDIMENT, SOIL, AND GROUNDWATER CONTAMINATION. THESE FACILITIES INCLUDE THE RONE D

REALTY INDUSTRIAL AREA, THE KLOCKNER AND KLOCKNER PROPERTY, THE PETTIT PAINTS FACILITY, AND THE STAPLING MACHINE COMPANY. THE PRIMARY CONTAMINANTS OF CONCERN ARE TCE AND PCE. SEVERAL INORGANIC COMPOUNDS INCLUDING CHROMIUM, LEAD, AND NICKEL WERE ALSO IDENTIFIED. THIS CONTAMINATION, WHICH HAS AFFECTED THE WELL FIELD, EMANATES FROM MULTIPLE SOURCE AREAS WITHIN ROCKAWAY BOROUGH.

THE PRESENCE OF VOC CONTAMINATION CAUSED THE BOROUGH OF ROCKAWAY TO CONSTRUCT A THREE-BED GRANULAR ACTIVATED CARBON (GAC) ADSORPTION TREATMENT SYSTEM. THE SYSTEM BEGAN OPERATING IN JULY 1981, TREATING APPROXIMATELY 900,000 GALLONS PER DAY (GPD) OF RAW WATER PUMPED FROM THE BOROUGH'S WELLS. OVERALL, THE SYSTEM HAS REDUCED THE VOC CONTAMINANT CONCENTRATIONS IN THE MUNICIPAL WATER SUPPLY TO LEVELS MEETING THE STATE AND FEDERAL DRINKING WATER STANDARDS.

IN DECEMBER 1982, THE SITE WAS PLACED ON THE US ENVIRONMENTAL PROTECTION AGENCY'S (EPA'S) NATIONAL PRIORITIES LIST OF SUPERFUND SITES. UNDER A COOPERATIVE AGREEMENT WITH EPA, NJDEPE INITIATED A REMEDIAL INVESTIGATION AND FEASIBILITY STUDY (RI/FS) TO DETERMINE THE NATURE AND EXTENT OF CONTAMINATION. THE FIRST OPERABLE UNIT RI/FS, CONDUCTED BY NJDEPE, CONFIRMED THE PRESENCE OF THE VOC CONTAMINATION, BUT WAS UNABLE TO DETERMINE THE OVERALL EXTENT OR SOURCE(S) OF THE CONTAMINATION. THE RI/FS UTILIZED A SOIL GAS SURVEY THAT IDENTIFIED THREE POTENTIAL SOURCE AREAS WITHIN THE BOROUGH, ALTHOUGH THE HORIZONTAL AND VERTICAL EXTENT OF GROUNDWATER AND SOIL CONTAMINATION WAS NOT DEFINED. AS PART OF THE STUDY, REMEDIAL ALTERNATIVES WERE DEVELOPED AND EVALUATED TO ADDRESS THE KNOWN CONTAMINATION.

FOLLOWING A PUBLIC MEETING, AT WHICH THE RESULTS OF THE RI/FS WERE PRESENTED, AND A 30-DAY PUBLIC COMMENT PERIOD, EPA SIGNED A RECORD OF DECISION (ROD) ON SEPTEMBER 29, 1986. THIS ROD SELECTED A REMEDY FOR THE ROCKAWAY BOROUGH WELL FIELD SITE WITH THE CONCURRENCE OF THE NJDEPE. THE SELECTED REMEDY CALLED FOR THE BOROUGH TO CONTINUE TO OPERATE AND MAINTAIN THE EXISTING GAC FILTRATION SYSTEM, BUT NOTED THAT THE CARBON SHOULD BE CHANGED MORE FREQUENTLY. THE ROD ALSO DIRECTED THE CONTINUATION OF THE RI/FS IN AN ATTEMPT TO POSITIVELY IDENTIFY THE CONTAMINANT SOURCE(S) AND FURTHER DELINEATE THE FULL EXTENT OF CONTAMINATION.

IN RECENT COMMUNICATIONS, ROCKAWAY BOROUGH HAS REQUESTED EPA APPROVAL OF A MODIFICATION OF THE CURRENT TREATMENT SYSTEM AS APPROVED OF IN THE 1986 ROD. THIS MODIFICATION WOULD INCLUDE THE INSTALLATION OF AN AIR STRIPPER AS THE FIRST STAGE IN THE TREATMENT PROCESS TO BE FOLLOWED BY THE GAC SYSTEM. THE BOROUGH HAS DETERMINED THAT DUE TO INCREASES IN DRINKING WATER STANDARDS AND THE COST OF CARBON REPLACEMENT, THE PROPOSED UPGRADE OF THE TREATMENT PROCESS WOULD BE COST-EFFECTIVE.

SINCE, WITH THIS MODIFICATION, THE TREATMENT WOULD CONTINUE TO BE PROTECTIVE OF PUBLIC HEALTH AND THE ENVIRONMENT, CONTINUE TO PROVIDE POTABLE WATER WHICH MEETS FEDERAL AND STATE DRINKING WATER STANDARDS, AND BE MORE COST-EFFECTIVE FOR THE BOROUGH TO OPERATE AND MAINTAIN, EPA HAS DETERMINED THAT IT IS CONSISTENT WITH THE 1986 ROD AND, THEREFORE, EPA HAS NO OBJECTION TO IT BEING IMPLEMENTED BY THE BOROUGH. FURTHER, EPA RECOGNIZES THAT CONTINUED OPERATION OF THE BOROUGH'S WATER TREATMENT SYSTEM IS AN INTEGRAL PART OF THE REMEDY SELECTED IN THIS ROD AND, THEREFORE, SUPPORTS ANY MEASURES TAKEN TO REDUCE OPERATIONAL COSTS.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

A COMMUNITY RELATIONS PLAN (CRP) WAS DEVELOPED TO ENSURE THE PUBLIC OPPORTUNITIES FOR INVOLVEMENT IN SITE-RELATED DECISIONS, INCLUDING SITE ANALYSIS AND CHARACTERIZATION, ALTERNATIVES ANALYSIS, AND REMEDY SELECTION. IN ADDITION, THE CRP WAS USED BY EPA TO DETERMINE, BASED ON COMMUNITY INTERVIEWS, ACTIVITIES TO ENSURE PUBLIC INVOLVEMENT AND TO PROVIDE OPPORTUNITIES FOR THE COMMUNITY TO LEARN ABOUT THE SITE.

EPA HELD A MEETING IN AUGUST 1986 TO EXPLAIN THE INITIAL RI/FS TO THE PUBLIC AND TO REPORT ON THE PROGRESS BEING MADE AT THE SITE. THE RESULTS OF THE RI/FS WERE PRESENTED AND GROUNDWATER REMEDIATION EFFORTS PLANNED FOR THE NEAR FUTURE WERE DISCUSSED.

ANOTHER MEETING WAS HELD IN NOVEMBER 1989. THE PURPOSE OF THE MEETING WAS TO PROVIDE RESIDENTS AND LOCAL OFFICIALS WITH AN UPDATE ON PAST ACTIVITIES CONDUCTED BY EPA AND NJDEPE, AND TO DISCUSS THE ACTIVITIES OF THE SUPPLEMENTAL RI/FS.

THE SUPPLEMENTAL RI AND FS REPORTS, WHICH ADDRESSED THE GROUNDWATER CONTAMINATION, WERE RELEASED TO THE PUBLIC IN JULY 1991. A PROPOSED PLAN, THAT IDENTIFIED EPA'S PREFERRED REMEDIAL ALTERNATIVE, WAS RELEASED ON

JULY 18, 1991. THE DOCUMENTS WERE MADE AVAILABLE TO THE PUBLIC AT INFORMATION REPOSITORIES MAINTAINED AT THE ROCKAWAY FREE PUBLIC LIBRARY AND THE ROCKAWAY BOROUGH MUNICIPAL COMPLEX. THE ADMINISTRATIVE RECORD FOR THE SITE IS LOCATED AT THE ROCKAWAY FREE PUBLIC LIBRARY. A PUBLIC COMMENT PERIOD WAS HELD FROM JULY 18 THROUGH SEPTEMBER 16, 1991. A PUBLIC MEETING WAS HELD ON AUGUST 12, 1991, TO PRESENT THE FINDINGS OF THE RI/FS AND THE PROPOSED PLAN, AND TO SOLICIT PUBLIC INPUT. THE ISSUES RAISED AT THE PUBLIC MEETING AND DURING THE PUBLIC COMMENT PERIOD ARE ADDRESSED IN THE RESPONSIVENESS SUMMARY, WHICH IS PART OF THIS RECORD OF DECISION. THIS DECISION DOCUMENT PRESENTS THE SELECTED REMEDIAL ACTION FOR THE ROCKAWAY BOROUGH WELL FIELD SITE, CHOSEN IN ACCORDANCE WITH THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT (CERCLA), AS AMENDED BY THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA), AND, TO THE EXTENT PRACTICABLE, THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN (NCP). THE DECISION FOR THIS SITE IS BASED ON THE ADMINISTRATIVE RECORD.

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SCOPE AND ROLE OF ACTION

THIS DOCUMENT ADDRESSES THE REQUIREMENT OF THE 1986 ROD WHICH CALLED FOR THE PREPARATION OF A SUPPLEMENTAL RI/FS, AND DEALS SPECIFICALLY WITH CONTAMINATION IN GROUNDWATER. THE SELECTED REMEDIAL ACTION ENTAILS PUMPING AND TREATING CONTAMINATED GROUNDWATER FOR RESTORATION OF THE AQUIFER. THIS RESTORATION WILL TAKE AN ESTIMATED 27 YEARS TO COMPLETE; HOWEVER, ACTUAL AQUIFER CONDITIONS DURING REMEDIATION MAY AFFECT THIS DURATION.

AS NOTED ABOVE, THIS DOCUMENT DEALS SPECIFICALLY WITH REMEDIATION OF THE GROUNDWATER. ADDITIONAL INVESTIGATIONS TO FURTHER DELINEATE THE EXTENT OF CONTAMINATION WITHIN THE IMMEDIATE SOURCE AREAS WILL BE NECESSARY. WHILE THE PURPOSE OF THE REMEDIAL ACTION IS TO ACHIEVE THE GOAL OF AQUIFER RESTORATION, IT DOES NOT CONSTITUTE A FINAL ACTION FOR THE SITE. A SUBSEQUENT OPERABLE UNIT WILL BE NECESSARY TO EVALUATE THE NEED FOR REMEDIATION OF CONTAMINATION SOURCES.

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SUMMARY OF SITE CHARACTERISTICS

ALTHOUGH THE 1986 ROD SELECTED A REMEDY FOR THE SITE, THE DATA OBTAINED DURING THE INITIAL RI/FS WERE INSUFFICIENT TO FULLY CHARACTERIZE THE GROUNDWATER PLUME AND POSITIVELY IDENTIFY SOURCE AREAS. THEREFORE, IT WAS NECESSARY FOR EPA TO CONDUCT A SUPPLEMENTAL STUDY.

THE FIELD INVESTIGATION AT THE ROCKAWAY BOROUGH WELL FIELD SITE CONSISTED OF A SOIL BORING AND GROUNDWATER MONITORING WELL INSTALLATION PROGRAM, AND THE SAMPLING OF SUBSURFACE SOILS AND GROUNDWATER.

SOIL

THE SOIL SAMPLING PROGRAM INCLUDED FIVE SOIL BORINGS TAKEN IN AN AREA THAT MAY HAVE BEEN ONCE USED AS A MUNICIPAL LANDFILL LOCATED NEAR JOHN AND BARNETT STREETS IN THE NORTHEAST SECTION OF ROCKAWAY BOROUGH. VOC CONTAMINATION WAS DETECTED IN ONE SOIL BORING, BUT DID NOT EXCEED THE NJDEPE SOIL ACTION LEVEL. EIGHT ADDITIONAL SOIL BORINGS WERE LOCATED THROUGHOUT ROCKAWAY BOROUGH AT SUSPECTED CONTAMINANT SOURCE AREAS. FIGURE 1 SHOWS THE LOCATIONS OF THE SOIL BORINGS. THESE SOIL BORINGS WERE EVENTUALLY CONVERTED TO MONITORING WELLS DURING THE RI. INORGANIC CONTAMINATION WAS DETECTED IN SOIL BORING SAMPLES IN THE FORMER MORRIS CANAL, NEAR THE WALL STREET/EAST MAIN STREET AREA, AND THE DYE PIT AREA, NEAR THE CURRENT LOCATION OF THE SAINTS PETER & PAUL ORTHODOX CHURCH. OF THE 18 INORGANIC COMPOUNDS IDENTIFIED IN THE SUBSURFACE SOIL, BERYLLIUM WAS DETECTED AT LEVELS SLIGHTLY ABOVE NJDEPE INTERIM SOIL ACTION LEVELS. ARSENIC AND CHROMIUM WERE ALSO DETECTED ABOVE NJDEPE SOIL ACTION LEVELS. TABLES 1 AND 2 SHOW THE CONCENTRATIONS OF CONTAMINATION FOUND THROUGH THE SOIL SAMPLING PROGRAM.

GROUNDWATER

TWO ROUNDS OF GROUNDWATER SAMPLES WERE COLLECTED DURING THE SUPPLEMENTAL, OR PHASE II RI. THE FIRST SAMPLING ROUND OCCURRED IN OCTOBER 1989 AND CONSISTED OF SAMPLING 23 EXISTING MONITORING WELLS. THE SECOND ROUND OF SAMPLING OCCURRED IN SEPTEMBER 1990 AND CONSISTED OF SAMPLING GROUNDWATER IN 11 NEWLY INSTALLED PHASE II

MONITORING WELLS IN ADDITION TO 44 OTHER MONITORING WELLS LOCATED THROUGHOUT ROCKAWAY BOROUGH. FIGURE 1 SHOWS THE LOCATIONS OF THE MONITORING WELLS. GROUNDWATER SAMPLES OBTAINED FROM SHALLOW, INTERMEDIATE, AND DEEP WELLS WERE ANALYZED AND THE RESULTS DEMONSTRATED THAT THE GROUNDWATER IS CONTAMINATED WITH VOCS AND METALS. TABLES 3 THROUGH 5 SHOW THE CONCENTRATION OF THE CONTAMINANTS FOUND IN THE GROUNDWATER.

A TOTAL OF 12 ORGANIC COMPOUNDS WERE DETECTED IN THE GROUNDWATER IN ROCKAWAY BOROUGH. VOCS WERE THE MOST FREQUENTLY DETECTED ORGANIC CHEMICALS AND OF THESE, PCE AND TCE WERE THE MOST COMMON. TCE WAS FOUND IN SIGNIFICANTLY HIGHER CONCENTRATIONS THAN PCE. CONCENTRATIONS OF BOTH CONTAMINANTS EXCEEDED THE MAXIMUM CONTAMINANT LEVELS (MCLS) WHICH HAVE BEEN DEVELOPED TO PROTECT DRINKING WATER. TCE WAS DETECTED AT CONCENTRATIONS AS HIGH AS 5,900 PARTS PER BILLION (PPB) IN AN INTERMEDIATE DEPTH GROUNDWATER MONITORING WELL, AND PCE WAS DETECTED AT CONCENTRATIONS AS HIGH AS 570 PPB IN A SHALLOW WELL. THE NEW JERSEY SAFE DRINKING WATER ACT MCL FOR BOTH OF THESE CONTAMINANTS IS 1 PPB. THE OTHER ORGANIC CHEMICALS WERE DETECTED INFREQUENTLY IN THE GROUNDWATER AT GENERALLY LOW (WT5 PPB) CONCENTRATIONS.

THE EXTENT OF GROUNDWATER CONTAMINATION BY INORGANIC COMPOUNDS WAS EVALUATED BASED ON THE RESULTS OF SAMPLES COLLECTED FROM THE 11 NEWLY INSTALLED MONITORING WELLS. CHROMIUM, BERYLLIUM, AND NICKEL WERE DETECTED AT LEVELS ABOVE THE PRIMARY MCLS. THE HIGHEST LEVEL OF CHROMIUM WAS DETECTED IN A WALL STREET/EAST MAIN STREET MONITORING WELL AT A LEVEL OF 1,170 PPB. THE MCL FOR CHROMIUM IS 50 PPB.

BASED ON THE SAMPLING PROGRAM CONDUCTED IN THE RI, GROUNDWATER IS CONTAMINATED IN THE KLOCKNER AND KLOCKNER, RONE REALTY, AND THE WALL STREET/EAST MAIN STREET AREAS, WITH THE MOST EXTENSIVE CONTAMINATION PRESENT NEAR THE KLOCKNER AND KLOCKNER PROPERTY. FIGURE 2 SHOWS THE CONCEPTUAL LOCATION OF THE THREE AREAS OF ORGANIC GROUNDWATER CONTAMINATION. THE EXTENT OF ORGANIC CONTAMINATION IN THE GROUNDWATER IS GENERALLY DESCRIBED AS FOLLOWS:

KLOCKNER & KLOCKNER AREA - THE PLUME IS APPROXIMATELY 1,125 FEET WIDE BY 1,375 FEET LONG, AND 100 FEET DEEP. THE CONTAMINATED GROUNDWATER VOLUME IS ESTIMATED TO BE APPROXIMATELY 290 MILLION GALLONS. ORGANIC CONTAMINANT LEVELS RANGE FROM 0.5 TO 570 PPB FOR PCE AND FROM 0.3 TO 5,900 PPB FOR TCE.

RONE REALTY INDUSTRIAL AREA - THE PLUME IS APPROXIMATELY 500 FEET IN DIAMETER. THE CONTAMINATED GROUNDWATER VOLUME IS APPROXIMATELY 11 MILLION GALLONS. ORGANIC CONTAMINATION IS PRIMARILY TCE, WHICH RANGES FROM 1.1 TO 4.3 PPB.

WALL STREET/EAST MAIN STREET AREA - THE PLUME IS APPROXIMATELY 500 FEET WIDE BY 1,750 FEET LONG, AND 85 FEET DEEP. THE CONTAMINATED GROUNDWATER VOLUME IS ESTIMATED TO BE APPROXIMATELY 139 MILLION GALLONS. ORGANIC CONTAMINATION IS PRIMARILY PCE, WHICH RANGES FROM 3.3 TO 120 PPB.

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SUMMARY OF SITE RISKS

HUMAN HEALTH RISKS

EPA CONDUCTED A PUBLIC HEALTH EVALUATION (PHE) OF THE "NO ACTION" ALTERNATIVE TO EVALUATE THE POTENTIAL RISKS TO HUMAN HEALTH AND THE ENVIRONMENT ASSOCIATED WITH THE ROCKAWAY BOROUGH WELL FIELD SITE IN ITS CURRENT STATE. THIS RISK ASSESSMENT ONLY ADDRESSED THOSE POTENTIAL HUMAN HEALTH IMPACTS ASSOCIATED WITH DOMESTIC USE OF UNTREATED GROUNDWATER FROM THE ROCKAWAY BOROUGH WELL FIELD SITE. BECAUSE A GROUNDWATER TREATMENT SYSTEM IS CURRENTLY IN PLACE IN THE BOROUGH, DOMESTIC USE OF UNTREATED GROUNDWATER IS CONSIDERED UNLIKELY. HOWEVER, THE HUMAN HEALTH RISKS ASSOCIATED WITH SUCH USE WERE EVALUATED TO PROVIDE A RISK-BASED MEASURE OF THE EXTENT OF CONTAMINATION ASSOCIATED WITH THE VARIOUS SOURCE AREAS WITHIN ROCKAWAY BOROUGH. THIS ASSESSMENT WAS NOT INTENDED TO PROVIDE A COMPLETE OR EXHAUSTIVE CHARACTERIZATION OF ALL RISKS POTENTIALLY ASSOCIATED WITH GROUNDWATER OR OTHER CONTAMINATION IN THE ROCKAWAY BOROUGH AREA.

THE RISK ASSESSMENT FOCUSED ON THE CONTAMINANTS WHICH ARE LIKELY TO POSE THE MOST SIGNIFICANT RISKS TO HUMAN HEALTH AND THE ENVIRONMENT (CHEMICALS OF POTENTIAL CONCERN). THESE "CHEMICALS OF POTENTIAL CONCERN" AND THEIR CONCENTRATIONS IN GROUNDWATER ARE SHOWN IN TABLE 6, AND INCLUDE VOLATILE ORGANIC COMPOUNDS (PRIMARILY TCE AND PCE) AND HEAVY METALS.

GROUNDWATER MONITORING DATA OBTAINED DURING THE RI INDICATE THAT CHEMICALS HAVE BEEN RELEASED TO AND ARE BEING TRANSPORTED IN GROUNDWATER. HOWEVER, BECAUSE THERE IS CURRENTLY NO USE OF UNTREATED GROUNDWATER BY RESIDENTS OR OTHER PERSONS IN ROCKAWAY BOROUGH, NO COMPLETE EXPOSURE PATHWAYS EXIST UNDER CURRENT LAND-USE CONDITIONS. POTENTIAL RISKS ASSOCIATED WITH IN-HOME USE OF GROUNDWATER WERE EVALUATED TO PROVIDE A RISK-BASED MEASURE OF THE EXTENT OF CONTAMINATION RESULTING FROM THE VARIOUS SOURCE AREAS WITHIN THE BOROUGH.

EPA'S PHE IDENTIFIED SEVERAL POTENTIAL EXPOSURE PATHWAYS BY WHICH THE PUBLIC COULD BE EXPOSED TO CONTAMINANT RELEASES FROM THE ROCKAWAY BOROUGH WELL FIELD SITE. PERSONS USING UNTREATED GROUNDWATER AS A DOMESTIC WATER SUPPLY COULD BE EXPOSED TO CHEMICALS IN GROUNDWATER THROUGH THE INGESTION OF DRINKING WATER, INHALATION OF CHEMICALS THAT HAVE VOLATILIZED FROM GROUNDWATER DURING USE (WHILE SHOWERING, COOKING, WATERING THE LAWN), AND DERMAL CONTACT WITH GROUNDWATER DURING IN-HOME USE (WHILE BATHING, SWIMMING IN POOLS, WASHING DISHES).

UNDER CURRENT EPA GUIDELINES, THE LIKELIHOOD OF CARCINOGENIC (CANCER CAUSING) AND NONCARCINOGENIC EFFECTS DUE TO EXPOSURE TO SITE CHEMICALS ARE CONSIDERED SEPARATELY. IT WAS ASSUMED THAT THE TOXIC EFFECTS OF THE SITE-RELATED CHEMICALS WOULD BE ADDITIVE. THUS, CARCINOGENIC AND NONCARCINOGENIC RISKS ASSOCIATED WITH EXPOSURES TO INDIVIDUAL INDICATOR COMPOUNDS WERE SUMMED TO INDICATE THE POTENTIAL RISKS ASSOCIATED WITH MIXTURES OF POTENTIAL CARCINOGENS AND NONCARCINOGENS, RESPECTIVELY. THE HEALTH EFFECTS CRITERIA FOR THE CHEMICALS OF POTENTIAL CONCERN ARE PRESENTED IN TABLE 7.

NONCARCINOGENIC RISKS WERE ASSESSED USING A HAZARD INDEX (HI) APPROACH, BASED ON A COMPARISON OF EXPECTED CONTAMINANT INTAKES AND SAFE LEVELS OF INTAKE (REFERENCE DOSES). REFERENCE DOSES (RFDs) HAVE BEEN DEVELOPED BY EPA FOR INDICATING THE POTENTIAL FOR ADVERSE HEALTH EFFECTS. RFDs, WHICH ARE EXPRESSED IN UNITS OF MILLIGRAMS PER KILOGRAM PER DAY (MG/KG-DAY), ARE ESTIMATES OF DAILY EXPOSURE LEVELS FOR HUMANS WHICH ARE THOUGHT TO BE SAFE OVER A LIFETIME (INCLUDING SENSITIVE INDIVIDUALS). ESTIMATED INTAKES OF CHEMICALS FROM ENVIRONMENTAL MEDIA (E.G., THE AMOUNT OF A CHEMICAL INGESTED FROM CONTAMINATED DRINKING WATER) ARE COMPARED WITH THE RFD TO DERIVE THE HAZARD QUOTIENT FOR THE CONTAMINANT IN THE PARTICULAR MEDIA. THE HAZARD INDEX IS OBTAINED BY ADDING THE HAZARD QUOTIENTS FOR ALL COMPOUNDS ACROSS ALL MEDIA. A HAZARD INDEX GREATER THAN 1 INDICATES THAT THE POTENTIAL EXISTS FOR NONCARCINOGENIC HEALTH EFFECTS TO OCCUR AS A RESULT OF SITE-RELATED EXPOSURES. THE HI PROVIDES A USEFUL REFERENCE POINT FOR GAUGING THE POTENTIAL SIGNIFICANCE OF MULTIPLE CONTAMINANT EXPOSURES WITHIN A SINGLE MEDIUM OR ACROSS MEDIA.

POTENTIAL CARCINOGENIC RISKS WERE EVALUATED USING THE CANCER POTENCY FACTORS DEVELOPED BY EPA FOR THE INDICATOR COMPOUNDS. CANCER POTENCY FACTORS (CPF's) HAVE BEEN DEVELOPED BY EPA'S CARCINOGENIC RISK ASSESSMENT VERIFICATION ENDEAVOR FOR ESTIMATING EXCESS LIFETIME CANCER RISKS ASSOCIATED WITH EXPOSURE TO POTENTIALLY CARCINOGENIC CHEMICALS. CPF's, WHICH ARE EXPRESSED IN UNITS OF (MG/KG-DAY)⁻¹, ARE MULTIPLIED BY THE ESTIMATED INTAKE OF A POTENTIAL CARCINOGEN, IN MG/KG-DAY, TO GENERATE AN UPPER-BOUND ESTIMATE OF THE EXCESS LIFETIME CANCER RISK ASSOCIATED WITH EXPOSURE TO THE COMPOUND AT THAT INTAKE LEVEL. THE TERM "UPPER BOUND" REFLECTS THE CONSERVATIVE ESTIMATE OF THE RISKS CALCULATED FROM THE CPF. USE OF THIS APPROACH MAKES THE UNDERESTIMATION OF THE RISK HIGHLY UNLIKELY.

FOR KNOWN OR SUSPECTED CARCINOGENS, EPA CONSIDERS EXCESS UPPER- BOUND INDIVIDUAL LIFETIME CANCER RISKS OF BETWEEN 1 X (10⁻⁴) TO 1 X (10⁻⁶) TO BE ACCEPTABLE. THIS LEVEL INDICATES THAT AN INDIVIDUAL HAS NO GREATER THAN A ONE IN TEN THOUSAND TO ONE IN A MILLION CHANCE OF DEVELOPING CANCER AS A RESULT OF EXPOSURE TO SITE CONDITIONS OVER A 30-YEAR PERIOD.

THE HAZARD INDICES AND CANCER RISKS ASSOCIATED WITH THE POTENTIAL EXPOSURE PATHWAYS AT THE ROCKAWAY BOROUGH WELL FIELD SITE ARE PRESENTED IN TABLE 8. THE DOMINANT HEALTH RISK IS POSED BY THE POTENTIAL FUTURE USE OF GROUNDWATER FOR DRINKING AND SHOWERING. BASED ON THE CONTAMINANT CONCENTRATIONS IDENTIFIED IN THE UPPER PORTION OF THE AQUIFER IN ROCKAWAY BOROUGH, INGESTION OF GROUNDWATER FROM THE KLOCKNER AND KLOCKNER REGION WOULD POSE THE GREATEST CARCINOGENIC AND NONCARCINOGENIC RISK TO RESIDENTS. FOR ADULTS, THE EXCESS LIFETIME CANCER RISKS IS 1 X (10⁻³) (ONE IN A THOUSAND) AND THE HAZARD INDEX IS 30. FOR PERSONS EXPOSED FROM BIRTH TO AGE 30, THE EXCESS LIFETIME CANCER RISK IS 2 X (10⁻³) AND THE HAZARD INDEX IS 40. THIS IS PRIMARILY DUE TO THE LIVER TOXICANTS, PCE AND TCE. IN THE RONE REALTY INDUSTRIAL AREA, THE EXCESS LIFETIME CANCER RISK FOR ADULTS IS 4 X (10⁻⁴) (FOUR IN TEN THOUSAND) AND THE HAZARD INDEX IS 6. FOR PERSONS EXPOSED FROM BIRTH TO AGE 30, THE EXCESS LIFETIME CANCER RISK IS 6 X (10⁻⁴) AND THE HAZARD INDEX IS 8. THE EXCESS LIFETIME CANCER RISKS FOR ADULTS IN THE WALL STREET/EAST MAIN STREET AREA IS 3 X (10⁻⁴) AND THE HAZARD INDEX IS 8. FOR PERSONS EXPOSED FROM BIRTH TO AGE 30, THE EXCESS LIFETIME CANCER RISK IS 4 X (10⁻⁴) AND THE HAZARD INDEX IS

10. SIMILARITIES OF RISKS BETWEEN THE ROUNDED REALTY INDUSTRIAL AREA AND THE WALL STREET/EAST MAIN STREET AREA ARE PRIMARILY DUE TO VARYING LEVELS OF POTENTIAL CONTAMINANTS OF CONCERN OTHER THAN TCE AND PCE.

AS IN ANY RISK ASSESSMENT, THE ESTIMATES OF RISK FOR THE ROCKAWAY BOROUGH WELL FIELD SITE HAVE MANY UNCERTAINTIES. AS A RESULT OF THE UNCERTAINTIES, THE RISK ASSESSMENT SHOULD NOT BE CONSTRUED AS PRESENTING AN ABSOLUTE ESTIMATE OF RISKS TO HUMAN OR ENVIRONMENTAL POPULATIONS. RATHER, IT IS A CONSERVATIVE ANALYSIS INTENDED TO INDICATE THE POTENTIAL FOR ADVERSE IMPACTS TO OCCUR.

ENVIRONMENTAL EVALUATION

THIS RISK ASSESSMENT ONLY ADDRESSED THOSE POTENTIAL HUMAN HEALTH IMPACTS ASSOCIATED WITH DOMESTIC USE OF UNTREATED GROUNDWATER. ENVIRONMENTAL IMPACTS WERE NOT ADDRESSED IN THIS RISK ASSESSMENT.

CONCLUSION

ACTUAL OR THREATENED RELEASES OF HAZARDOUS SUBSTANCES FROM THIS SITE, IF NOT ADDRESSED BY IMPLEMENTING THE RESPONSE ACTION SELECTED IN THIS ROD, MAY PRESENT AN IMMINENT AND SUBSTANTIAL ENDANGERMENT TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT.

#RA

REMEDIAL ACTION OBJECTIVES

THE GOAL FOR THE CLEANUP OF THE GROUNDWATER CONTAMINATION AT THE ROCKAWAY BOROUGH WELL FIELD SITE IS TO RESTORE THE GROUNDWATER TO THE MCLS WHICH HAVE BEEN DEVELOPED TO PROTECT DRINKING WATER. MCLS ARE ENFORCEABLE STANDARDS BASED ON HEALTH RISKS ASSOCIATED WITH AN INDIVIDUAL'S CONSUMPTION OF TWO LITERS OF WATER PER DAY OVER A 70-YEAR PERIOD. THEREFORE, HEALTH RISKS ASSOCIATED WITH THE GROUNDWATER CONTAMINATION RESULTING FROM THE SITE WILL BE REDUCED TO WITHIN THE ACCEPTABLE RANGE OF BETWEEN 1×10^{-4} TO 1×10^{-6} FOR CARCINOGENS, AND THE HAZARD INDICES FOR NONCARCINOGENS WILL BE LESS THAN ONE. THE MCLS FOR THE CONTAMINANTS OF CONCERN AT THE SITE ARE SHOWN ON TABLE 9. THE AREA OF ATTAINMENT IS THE CONTAMINATED GROUNDWATER PLUME.

#DRA

DESCRIPTION OF REMEDIAL ALTERNATIVES

THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980, AS AMENDED, REQUIRES THAT EACH SELECTED SITE REMEDY BE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, COMPLY WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS), UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE, AND BE COST EFFECTIVE.

THE RI IDENTIFIED THE GROUNDWATER ITSELF AS THE PRINCIPAL ENVIRONMENTAL MEDIUM AFFECTED BY CONTAMINATION. THE SOURCES OF THIS GROUNDWATER CONTAMINATION ARE NOT ADDRESSED BY THIS ROD.

THE FS EVALUATED, IN DETAIL, THREE MAIN ALTERNATIVES FOR REMEDIATING THE GROUNDWATER. ALTERNATIVES 2 AND 3 HAVE BEEN FURTHER BROKEN DOWN INTO SEPARATE COMPONENTS. A BRIEF DESCRIPTION OF EACH OF THE ALTERNATIVES, AS WELL AS AN ESTIMATE OF THEIR COST AND IMPLEMENTATION TIME FRAME, FOLLOWS.

ALTERNATIVE 1: NO FURTHER ACTION

ESTIMATED CAPITAL COST:	\$	0
ESTIMATED FIVE-YEAR REVIEW COST:	\$	44,000
ESTIMATED PRESENT WORTH:	\$	27,000

THE SUPERFUND PROGRAM REQUIRES THAT A "NO ACTION" ALTERNATIVE BE DEVELOPED AND EVALUATED AT EVERY SITE TO ESTABLISH A BASELINE FOR COMPARISON OF OTHER REMEDIAL ALTERNATIVES. UNDER THIS ALTERNATIVE, EPA WOULD TAKE NO FURTHER ACTION TO ADDRESS CONTAMINATION AT THE SITE. THIS ALTERNATIVE RELIES ENTIRELY ON NATURAL ATTENUATION AND THE EXISTING WATER SUPPLY TREATMENT SCHEME FOR ACHIEVING CLEANUP LEVELS. A FIVE-YEAR REVIEW WOULD BE CONDUCTED TO DETERMINE WHETHER OR NOT THE CONTAMINATION HAS SPREAD. IF NECESSARY, APPROPRIATE

ACTIONS WOULD BE CONSIDERED AT THAT TIME.

ALTERNATIVE 2: SEPARATE REMEDIATION OF PLUMES

OPTION 2A - EXTRACTION, AIR STRIPPING WITH TREATED WATER DISCHARGE

	REINJECTION TO GROUNDWATER	DISCHARGE TO SURFACE WATER
ESTIMATED CAPITAL COST:	\$ 6,386,000	\$ 6,217,000
ESTIMATED ANNUAL OPERATION AND MAINTENANCE (O&M) COSTS:	\$ 3,001,000	\$ 2,942,000
ESTIMATED PRESENT WORTH:	\$20,439,000	\$19,899,000
IMPLEMENTATION TIME FRAME:	27 YEARS	27 YEARS

THE MAJOR FEATURES OF THIS REMEDIAL ALTERNATIVE INCLUDE GROUNDWATER EXTRACTION (PUMPING AND COLLECTION) FROM ALL THREE CONTAMINANT PLUMES, CONSTRUCTION AND OPERATION OF THREE SEPARATE FACILITIES FOR GROUNDWATER TREATMENT, DISCHARGE OF THE TREATED WATER FROM THE THREE SEPARATE TREATMENT FACILITIES, AND A PERFORMANCE MONITORING PROGRAM.

GROUNDWATER WOULD BE EXTRACTED AT AN ESTIMATED TOTAL RATE OF 1,450,000 GALLONS PER DAY (GPD) FROM THE AQUIFER USING A SERIES OF APPROXIMATELY 12 EXTRACTION WELLS. THE GROUNDWATER EXTRACTION STRATEGY FOR THE INDIVIDUAL PLUMES WOULD BE DESIGNED TO CAPTURE THE BULK OF THE CONTAMINANTS FROM THE RESPECTIVE PLUMES. IT IS ESTIMATED THAT THREE EXTRACTION WELLS WOULD EXTRACT GROUNDWATER AT A RATE OF 130,000 GPD (TOTAL 390,000 GPD) FROM THE RONE REALTY INDUSTRIAL AREA. IT IS ESTIMATED THAT FIVE EXTRACTION WELLS WOULD EXTRACT GROUNDWATER AT 100,000 GPD (TOTAL 500,000 GPD) FROM THE WALL STREET/EAST MAIN STREET PLUME AND FOUR EXTRACTION WELLS WOULD EXTRACT GROUNDWATER AT 140,000 GPD (TOTAL 560,000 GPD) FROM THE KLOCKNER AND KLOCKNER PLUME. THE EXACT NUMBER AND LOCATION OF THE EXTRACTION WELLS WOULD BE DETERMINED DURING REMEDIAL DESIGN.

TREATMENT OF THE EXTRACTED GROUNDWATER WOULD INCLUDE CHEMICAL PRECIPITATION TO REMOVE INORGANIC CONTAMINANTS. THE RESULTANT SLUDGE WOULD REQUIRE APPROPRIATE OFF-SITE DISPOSAL. CHEMICAL PRECIPITATION WOULD THEN BE FOLLOWED BY AIR STRIPPING TO REMOVE VOCs FROM THE CONTAMINATED GROUNDWATER.

IT IS ESTIMATED THAT VOCs WOULD BE EMITTED FROM THE AIR STRIPPER AT LEVELS BELOW ALLOWABLE DISCHARGE RATES WITHOUT ANY AIR POLLUTION CONTROLS. HOWEVER, THE NEED FOR PROVISIONS TO DESTROY THEM BY CATALYTIC INCINERATION OR ADSORPTION USING VAPOR-PHASE ACTIVATED CARBON WILL BE EVALUATED DURING REMEDIAL DESIGN.

DISCHARGE OPTIONS INCLUDE EITHER REINJECTION INTO THE AQUIFER OR DISCHARGE TO THE SURFACE WATERS OF ROCKAWAY RIVER AND/OR BEAVER BROOK. FOR THE REINJECTION OPTIONS, GROUNDWATER WOULD BE TREATED TO MCLs AND REINJECTED INTO THE AQUIFER USING APPROXIMATELY 12 INJECTION WELLS. THE CONCEPTUAL LAYOUT OF THE SYSTEM INCLUDES THREE INJECTION WELLS LOCATED UPGRADIENT OF THE PLUME. THESE WELLS WOULD REINJECT INTO THE AQUIFER ALL OF THE TREATED GROUNDWATER FROM THE WALL STREET/EAST MAIN STREET PLUME. AT THE RONE REALTY INDUSTRIAL AREA, THREE INJECTION WELLS WOULD BE LOCATED ALONG THE CIRCULAR BOUNDARY OF THE PLUME IN ORDER TO REDIRECT THE GROUNDWATER FLOW AWAY FROM THE RIVER. FOR THE KLOCKNER AND KLOCKNER PLUME, THREE INJECTION WELLS WOULD BE LOCATED AT THE UPGRADIENT PLUME BOUNDARY. THE OTHER THREE INJECTION WELLS WOULD BE LOCATED NEAR THE NORTHEASTERN CORNER OF THE PLUME, WHERE THE GROUNDWATER DIVIDE IS LOCATED AT PRESENT. AN OPTION OF USING INFILTRATION GALLERIES WOULD ALSO BE EXPLORED. THE EXACT NUMBER AND LOCATION OF THE INJECTION WELLS WOULD BE DETERMINED DURING REMEDIAL DESIGN.

FOR SURFACE WATER DISCHARGE OPTIONS, THE GROUNDWATER WOULD BE TREATED TO LEVELS WHICH ATTAIN NEW JERSEY SURFACE WATER DISCHARGE LIMITATION REQUIREMENTS AND DISCHARGED TO ON-SITE SURFACE WATER BODIES. TREATED WATER FROM THE RONE REALTY INDUSTRIAL AREA AND THE WALL STREET/EAST MAIN STREET AREA WOULD BE DISCHARGED TO THE ROCKAWAY RIVER AND THE TREATED GROUNDWATER FROM THE KLOCKNER AND KLOCKNER AREA WOULD BE DISCHARGED TO BEAVER BROOK.

OPTION 2B - EXTRACTION, CHEMICAL OXIDATION ENHANCED BY ULTRA-VIOLET (UV) PHOTOLYSIS WITH TREATED WATER DISCHARGE

REINJECTION TO GROUNDWATER	DISCHARGE TO SURFACE WATER
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ESTIMATED CAPITAL COST:	\$ 6,369,000	\$ 6,304,000
ESTIMATED ANNUAL O&M COST:	\$ 3,063,000	\$ 3,004,000
ESTIMATED PRESENT WORTH:	\$ 20,888,000	\$ 20,349,000
IMPLEMENTATION PERIOD:	27 YEARS	27 YEARS

THIS OPTION IS BASICALLY THE SAME AS OPTION 2A, WITH THE EXCEPTION THAT CHEMICAL PRECIPITATION WOULD BE FOLLOWED BY CHEMICAL OXIDATION ENHANCED BY UV PHOTOLYSIS. IN ADDITION, UV PHOTOLYSIS OPTIONS MAY REQUIRE TREATABILITY STUDIES TO ESTABLISH OPERATING PARAMETERS FOR SITE-SPECIFIC CONDITIONS. THESE TREATABILITY STUDIES WOULD BE CONDUCTED DURING THE REMEDIAL DESIGN FOR THE SITE.

OPTION 2C - EXTRACTION, CARBON ADSORPTION WITH TREATED WATER DISCHARGE

REINJECTION TO GROUNDWATER	DISCHARGE TO SURFACE WATER
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ESTIMATED CAPITAL COST:	\$ 6,041,000	\$ 5,871,000
ESTIMATED ANNUAL O&M COST:	\$ 2,998,000	\$ 2,939,000
ESTIMATED PRESENT WORTH:	\$ 20,086,000	\$ 19,546,000
IMPLEMENTATION PERIOD:	27 YEARS	27 YEARS

THIS OPTION IS BASICALLY THE SAME AS OPTION 2A, WITH THE EXCEPTION THAT CHEMICAL PRECIPITATION WOULD BE FOLLOWED BY CARBON ADSORPTION TO REMOVE VOCs FROM THE CONTAMINATED GROUNDWATER. CARBON ADSORPTION TREATMENT WOULD REQUIRE OFF-SITE REGENERATION OR DISPOSAL OF THE SPENT CARBON.

ALTERNATIVE 3A: COMBINED REMEDIATION OF THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES AND NO FURTHER ACTION AT RONE D REALTY INDUSTRIAL AREA

OPTION 3A(1) - EXTRACTION, AIR STRIPPING WITH TREATED WATER DISCHARGE

REINJECTION TO GROUNDWATER	DISCHARGE TO SURFACE WATER
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ESTIMATED CAPITAL COSTS:	\$ 4,959,000	\$ 4,369,000
ESTIMATED ANNUAL O&M:	\$ 1,502,000	\$ 1,446,000
ESTIMATED PRESENT WORTH:	\$ 17,818,000	\$ 16,794,000
IMPLEMENTATION PERIOD:	27 YEARS	27 YEARS

THE MAJOR FEATURES OF THIS REMEDIAL ALTERNATIVE INCLUDE GROUNDWATER EXTRACTION (PUMPING AND COLLECTION) FROM THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES, THE CONSTRUCTION AND OPERATION OF A SINGLE TREATMENT FACILITY FOR GROUNDWATER TREATMENT, DISCHARGE OF TREATED WATER FROM THIS COMBINED TREATMENT FACILITY, AND A PERFORMANCE MONITORING PROGRAM. NO ACTIVE REMEDIAL MEASURES WOULD BE TAKEN FOR THE RONE D REALTY INDUSTRIAL AREA PLUME. THE RESIDUAL RISKS ASSOCIATED WITH THE RONE D REALTY INDUSTRIAL AREA ARE NOT CONSIDERED SIGNIFICANT, SINCE FLUSHING AND ATTENUATION PROCESSES ARE EXPECTED TO RESTORE THE AQUIFER QUALITY IN THAT AREA PRIOR TO THE COMPLETION OF THE REMEDIATION EFFORTS AT THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES.

CONCEPTUALLY, GROUNDWATER WOULD BE EXTRACTED AT A TOTAL RATE OF APPROXIMATELY 1,060,000 GPD FROM THE AQUIFER USING AN ESTIMATED NINE EXTRACTION WELLS. IT IS ANTICIPATED THAT FIVE EXTRACTION WELLS PUMPING AT APPROXIMATELY 100,000 GPD EACH FOR THE WALL STREET/EAST MAIN STREET PLUME, AND FOUR EXTRACTION WELLS PUMPING AT APPROXIMATELY 140,000 GPD EACH FOR THE KLOCKNER AND KLOCKNER PLUME WOULD BE REQUIRED. THE EXACT NUMBER AND LOCATION OF THE INJECTION WELLS WOULD BE DETERMINED DURING REMEDIAL DESIGN.

TREATMENT AND DISCHARGE OPTIONS FOR THIS OPTION ARE THE SAME AS THOSE FOR ALTERNATIVE 2, OPTION A. HOWEVER, ONE SINGLE TREATMENT FACILITY WOULD BE CONSTRUCTED, INSTEAD OF THREE SEPARATE FACILITIES DISCUSSED IN

ALTERNATIVE 2.

IT IS EXPECTED THAT THE AMOUNT OF GROUNDWATER TREATED WOULD VARY IN TIME. INITIALLY, GROUNDWATER WOULD BE TREATED AT A TOTAL RATE OF APPROXIMATELY 1,060,000 GPD, BUT WOULD DECREASE TO APPROXIMATELY 560,000 GPD AS THE WALL STREET/EAST MAIN STREET PLUME ATTAINED REMEDIATION GOALS (ESTIMATED AT APPROXIMATELY 11 YEARS). AT THAT POINT IN TIME, ONLY THE WELLS EXTRACTING GROUNDWATER FROM THE KLOCKNER AND KLOCKNER PLUME WOULD CONTINUE TO OPERATE (ESTIMATED AT APPROXIMATELY 16 MORE YEARS).

CONSIDERING THIS VARIATION IN TREATMENT REQUIREMENTS, A MODULAR APPROACH COULD BE USED IN ESTIMATING THE SIZE OF THE TREATMENT FACILITY. THE FACILITY COULD HAVE TWO MODULES, ESSENTIALLY ONE FOR EACH OF THE TWO PLUMES BEING TREATED. AS SOON AS THE REMEDIATION OF THE WALL STREET/EAST MAIN STREET AREA IS COMPLETED, ONE MODULE COULD BE SHUT OFF, ACHIEVING A SIGNIFICANT REDUCTION IN O&M COSTS FOR THE DURATION OF REMEDIATION. THE OVERALL CLEANUP TIME FRAME IS ESTIMATED TO BE 27 YEARS.

OPTION 3A(2) - EXTRACTION, CHEMICAL OXIDATION ENHANCED BY UV PHOTOLYSIS WITH TREATED WATER DISCHARGE

	REINJECTION TO GROUNDWATER	DISCHARGE TO SURFACE WATER
ESTIMATED CAPITAL COSTS:	\$ 5,040,000	\$ 4,450,000
ESTIMATED ANNUAL O&M:	\$ 1,547,000	\$ 1,491,000
ESTIMATED PRESENT WORTH:	\$ 17,448,000	\$ 16,424,000
IMPLEMENTATION PERIOD:	27 YEARS	27 YEARS

THIS OPTION IS BASICALLY THE SAME AS OPTION 3A(1), WITH THE EXCEPTION THAT CHEMICAL PRECIPITATION WOULD BE FOLLOWED BY CHEMICAL OXIDATION ENHANCED BY UV PHOTOLYSIS.

OPTION 3A(3) - EXTRACTION, CARBON ADSORPTION WITH TREATED WATER DISCHARGE

	REINJECTION TO GROUNDWATER	DISCHARGE TO SURFACE WATER
ESTIMATED CAPITAL COSTS:	\$ 4,882,000	\$ 4,292,000
ESTIMATED ANNUAL O&M:	\$ 1,501,000	\$ 1,444,000
ESTIMATED PRESENT WORTH:	\$ 16,922,000	\$ 15,898,000
IMPLEMENTATION PERIOD:	27 YEARS	27 YEARS

THIS OPTION IS BASICALLY THE SAME AS OPTION 3A(1), WITH THE EXCEPTION THAT CHEMICAL PRECIPITATION WOULD BE FOLLOWED BY CARBON ADSORPTION.

ALTERNATIVE 3B: COMBINED REMEDIATION OF THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES AND SEPARATE REMEDIATION OF THE RONE REALTY PLUME

THE MAJOR FEATURES OF THIS REMEDIAL ALTERNATIVE INCLUDE THE GROUNDWATER EXTRACTION (PUMPING AND COLLECTION) FROM ALL OF THE THREE CONTAMINANT PLUMES, CONSTRUCTION AND OPERATION OF TWO SEPARATE FACILITIES FOR GROUNDWATER TREATMENT, DISCHARGE OF THE TREATED WATER FROM THE TWO SEPARATE TREATMENT FACILITIES, AND A PERFORMANCE MONITORING PROGRAM.

THIS ALTERNATIVE INCLUDES THE COMBINED REMEDIATION OF THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES AS IN ALTERNATIVE 3A, WITH THE ADDITION OF A SEPARATE EXTRACTION AND TREATMENT SYSTEM FOR THE RONE REALTY PLUME. TREATMENT AND DISCHARGE OPTIONS FOR THIS ALTERNATIVE ARE THE SAME AS THOSE FOR ALTERNATIVES 2 AND 3A. HOWEVER, ONE TREATMENT FACILITY WOULD BE CONSTRUCTED FOR THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES WITH A SEPARATE TREATMENT FACILITY CONSTRUCTED FOR THE RONE REALTY INDUSTRIAL AREA PLUME.

UNDER THIS ALTERNATIVE, THE ESTIMATED PRESENT WORTH FOR TREATMENT BY AIR STRIPPING WITH TREATED WATER DISCHARGE IS \$19,441,000; BY UV PHOTOLYSIS, \$19,008,000; AND BY CARBON ADSORPTION, \$18,177,000.

#SCAA

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

EVALUATION CRITERIA

THE ALTERNATIVES NOTED ABOVE WERE EVALUATED USING CRITERIA DERIVED FROM THE NCP AND SARA. THESE CRITERIA RELATE DIRECTLY TO FACTORS MANDATED BY SARA IN SECTION 121, INCLUDING SECTION 121(B)(1)(A-G). THE CRITERIA ARE AS FOLLOWS:

- ! OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
- ! COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
- ! LONG-TERM EFFECTIVENESS AND PERMANENCE
- ! REDUCTION OF TOXICITY, MOBILITY, OR VOLUME VIA TREATMENT
- ! SHORT-TERM EFFECTIVENESS
- ! IMPLEMENTABILITY
- ! COST
- ! STATE ACCEPTANCE
- ! COMMUNITY ACCEPTANCE

COMPARISONS

A COMPARATIVE DISCUSSION OF THE MAJOR COMPONENTS OF THE ALTERNATIVES, USING THE EVALUATION CRITERIA, FOLLOWS.

OVERALL PROTECTION

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT IS THE CENTRAL MANDATE OF CERCLA, AS AMENDED. PROTECTION IS ACHIEVED BY REDUCING HEALTH AND ENVIRONMENTAL THREATS AND BY TAKING APPROPRIATE ACTION TO ENSURE THAT, IN THE FUTURE, THERE WOULD BE NO UNACCEPTABLE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT THROUGH ANY EXPOSURE PATHWAY.

THE "NO FURTHER ACTION" ALTERNATIVE WOULD NOT PROVIDE ANY ADDITIONAL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT THAN HAS BEEN PROVIDED BY THE REMEDY INITIATED BY THE BOROUGH OF ROCKAWAY AND LATER ENDORSED IN THE 1986 ROD. NO FURTHER TREATMENT WOULD BE PROVIDED, AND ONLY NATURAL AND PUMPING-INDUCED PROCESSES WOULD ATTENUATE GROUNDWATER CONTAMINATION. THE "NO FURTHER ACTION" ALTERNATIVE IS NOT CONSIDERED PROTECTIVE AND, THEREFORE, WILL NOT BE CONSIDERED FURTHER IN THE ANALYSIS OF OPTIONS FOR THIS SITE.

ALTERNATIVES 2 AND 3 ARE RESPONSIVE TO THE REMEDIAL ACTION OBJECTIVES AND PROVIDE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

THE MAJOR DIFFERENCE AMONG ALTERNATIVES 2 AND 3 IS THE MANNER IN WHICH GROUNDWATER IS TREATED AND DISCHARGED. SINCE ALL THE GROUNDWATER EXTRACTION AND TREATMENT OPTIONS WOULD MEET THE CLEANUP GOALS EFFECTIVELY, THE DEGREE OF PROTECTION IS NOT MUCH DIFFERENT.

AN IMPORTANT DIFFERENCE BETWEEN THE TWO TREATMENT ALTERNATIVES IS THE CONSTRUCTION OF THE TREATMENT FACILITIES. ALTERNATIVE 2 INCLUDES THE USE OF THREE SEPARATE FACILITIES (ONE FOR EACH PLUME) WHILE ALTERNATIVE 3 TREATS CONTAMINATED GROUNDWATER IN ONE COMBINED FACILITY. FOR ALTERNATIVE 3A, THERE IS NO PROVISION OF CONTROL MEASURES FOR THE RONE REALTY INDUSTRIAL AREA PLUME. HOWEVER, THE RESIDUAL RISKS ASSOCIATED WITH THAT AREA ARE NOT CONSIDERED SIGNIFICANT SINCE FLUSHING AND ATTENUATION PROCESSES WOULD ALLEVIATE GROUNDWATER CONTAMINATION.

COMPLIANCE WITH ARARS

SECTION 121(D) OF CERCLA REQUIRES THAT REMEDIES FOR SUPERFUND SITES COMPLY WITH FEDERAL AND STATE LAWS THAT ARE APPLICABLE AND LEGALLY ENFORCEABLE. REMEDIES MUST ALSO COMPLY WITH THE REQUIREMENTS OF LAWS AND REGULATIONS THAT ARE NOT APPLICABLE, BUT ARE RELEVANT AND APPROPRIATE. APPLICABLE REQUIREMENTS ARE DEFINED AS CLEANUP STANDARDS, STANDARDS OF CONTROL, AND OTHER SUBSTANTIVE ENVIRONMENTAL PROTECTION REQUIREMENTS, CRITERIA, OR LIMITATIONS PROMULGATED UNDER FEDERAL OR STATE LAW THAT SPECIFICALLY ADDRESS A HAZARDOUS SUBSTANCE, POLLUTANT, REMEDIAL ACTION, LOCATION, OR OTHER CIRCUMSTANCE AT A SUPERFUND SITE. RELEVANT AND APPROPRIATE REQUIREMENTS ARE DEFINED AS SUBSTANTIVE ENVIRONMENTAL PROTECTION REQUIREMENTS, CRITERIA, OR LIMITATIONS PROMULGATED UNDER FEDERAL OR STATE LAW THAT, WHILE NOT "APPLICABLE" TO A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION, LOCATION OR CIRCUMSTANCE AT A SUPERFUND SITE, ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT THE CERCLA SITE THAT THEIR USE IS WELL SUITED TO THE PARTICULAR SITE. EPA HAS ALSO DEVELOPED ANOTHER CATEGORY OF REQUIREMENTS, KNOWN AS "TO BE CONSIDERED" (TBCS), THAT INCLUDES NONPROMULGATED CRITERIA, ADVISORIES, GUIDANCE, AND PROPOSED STANDARDS ISSUED BY FEDERAL OR STATE GOVERNMENTS. TBCS ARE NOT POTENTIAL ARARS BECAUSE THEY ARE NEITHER PROMULGATED NOR ENFORCEABLE. IT MAY BE NECESSARY TO CONSULT TBCS TO INTERPRET ARARS, OR TO DETERMINE PRELIMINARY REMEDIATION GOALS WHEN ARARS DO NOT EXIST FOR PARTICULAR CONTAMINANTS. HOWEVER, IDENTIFICATION AND COMPLIANCE WITH TBCS IS NOT MANDATORY IN THE SAME WAY THAT IT IS FOR ARARS.

ARARS FOR THE ROCKAWAY BOROUGH WELL FIELD SITE INCLUDE THE MORE STRINGENT OF THE FEDERAL OR STATE MCLS, WHICH ARE SHOWN IN TABLES 9 AND 11, NEW JERSEY SURFACE WATER QUALITY STANDARDS, CLEAN WATER ACT AMBIENT WATER QUALITY CRITERIA, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION STANDARDS, THE RESOURCE CONSERVATION AND RECOVERY ACT, AND THE CLEAN AIR ACT.

EPA HAS DIVIDED ARARS INTO THREE CATEGORIES TO FACILITATE THEIR IDENTIFICATION:

ACTION-SPECIFIC ARARS ARE USUALLY TECHNOLOGY- OR ACTIVITY-BASED REQUIREMENTS OR LIMITATIONS ON ACTIONS OR CONDITIONS INVOLVING SPECIFIC SUBSTANCES.

CHEMICAL-SPECIFIC ARARS ARE USUALLY HEALTH- OR RISK-BASED NUMERICAL VALUES OR METHODOLOGIES USED TO DETERMINE ACCEPTABLE CONCENTRATIONS OF CHEMICALS THAT MAY BE FOUND IN OR DISCHARGED TO THE ENVIRONMENT.

LOCATION-SPECIFIC ARARS RESTRICT ACTIONS OR CONTAMINANT CONCENTRATIONS IN CERTAIN ENVIRONMENTALLY SENSITIVE AREAS. EXAMPLES OF AREAS REGULATED UNDER VARIOUS FEDERAL LAWS INCLUDE FLOODPLAINS, WETLANDS, AND LOCATIONS WHERE ENDANGERED SPECIES OR HISTORICALLY SIGNIFICANT CULTURAL RESOURCES ARE PRESENT.

THE GOAL FOR THE CLEANUP OF GROUNDWATER CONTAMINATION AT THE ROCKAWAY BOROUGH WELL FIELD SITE IS TO RESTORE THE GROUNDWATER TO THE MORE STRINGENT OF THE FEDERAL OR STATE MCLS WHICH HAVE BEEN DEvised TO PROTECT DRINKING WATER. FOR GROUNDWATER REINJECTION OPTIONS, EXTRACTED WATER WOULD BE TREATED TO MCLS, AND FOR SURFACE WATER DISCHARGE OPTIONS, IT WOULD BE TREATED TO ATTAIN NEW JERSEY SURFACE WATER DISCHARGE LIMITATION REQUIREMENTS.

THE TREATMENT PLANT AND ASSOCIATED FACILITIES FOR BOTH ALTERNATIVES 2 AND 3 WOULD BE OPERATED IN ACCORDANCE WITH FEDERAL AND STATE HAZARDOUS WASTE TREATMENT FACILITY REQUIREMENTS. BOTH ALTERNATIVES WOULD COMPLY WITH ALL PERTINENT CHEMICAL-SPECIFIC, ACTION-SPECIFIC, AND LOCATION-SPECIFIC ARARS AS REFERENCED EARLIER.

TO ENSURE COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT, A CULTURAL RESOURCES SURVEY WILL BE PREPARED DURING THE REMEDIAL DESIGN PHASE.

LONG-TERM EFFECTIVENESS AND PERMANENCE

THIS EVALUATION CRITERION REFERS TO THE ABILITY OF THE REMEDY TO MAINTAIN RELIABLE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT OVER TIME ONCE CLEANUP GOALS HAVE BEEN MET.

THE MAJOR BENEFITS ASSOCIATED WITH ALTERNATIVES 2 AND 3 INCLUDE MINIMIZATION OF MIGRATION OF CONTAMINATED GROUNDWATER AND REMOVAL OF CONTAMINANTS. THE BULK OF CONTAMINATED GROUNDWATER WOULD BE TREATED TO MEET ARARS RESULTING IN SIGNIFICANT REDUCTIONS OF RISKS TO HUMAN HEALTH AND THE ENVIRONMENT. THE EXTRACTED GROUNDWATER

WILL BE TREATED TO ACHIEVE THE MORE STRINGENT OF THE FEDERAL OR STATE MCLS PRIOR TO ITS REINJECTION INTO THE GROUND IN ORDER TO BRING THE AQUIFER TO ITS INTENDED BENEFICIAL USE WITHOUT TREATMENT. FOR DISCHARGE TO SURFACE WATER OPTIONS, GROUNDWATER WOULD BE TREATED TO ATTAIN NEW JERSEY SURFACE WATER DISCHARGE LIMITATION REQUIREMENTS. THE LONG-TERM PERFORMANCE MONITORING PROGRAM WOULD CONFIRM THE EFFECTIVENESS OF THE REMEDY.

FOR ALTERNATIVE 3A, THERE IS NO PROVISION OF CONTROL MEASURES FOR THE RONE REALTY INDUSTRIAL AREA PLUME. HOWEVER, THE RESIDUAL RISKS ASSOCIATED WITH THAT AREA ARE NOT CONSIDERED SIGNIFICANT, SINCE FLUSHING AND ATTENUATION PROCESSES ARE EXPECTED TO RESTORE THE AQUIFER QUALITY IN THAT AREA PRIOR TO THE COMPLETION OF THE REMEDIATION EFFORTS AT THE KLOCKNER AND KLOCKNER AND THE WALL STREET/EAST MAIN STREET PLUMES.

THE REMEDY WOULD BE DESIGNED TO PREVENT ADVERSE IMPACTS TO THE BOROUGH'S WELLS. AN ASSESSMENT WOULD BE MADE DURING THE DESIGN OF THE REMEDY TO ENSURE THAT ANY ADVERSE IMPACTS TO WETLAND AREAS WOULD ALSO BE MITIGATED. IF APPROPRIATE, SOME OF THE TREATED GROUNDWATER COULD BE DISCHARGED TO WETLAND AREAS TO HELP OFFSET ANY DEWATERING EFFECTS CREATED BY GROUNDWATER EXTRACTION. IT IS BELIEVED THAT REINJECTING THE TREATED WATER WILL MINIMIZE ADVERSE IMPACTS.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

THIS EVALUATION CRITERION RELATES TO THE PERFORMANCE OF A TECHNOLOGY OR REMEDIAL ALTERNATIVE IN TERMS OF ELIMINATING OR CONTROLLING RISKS POSED BY THE TOXICITY, MOBILITY, OR VOLUME OF HAZARDOUS SUBSTANCES.

ALTERNATIVES 2 AND 3 WOULD REDUCE THE TOXICITY, MOBILITY, AND VOLUME OF THE CONTAMINANTS PRESENT IN THE GROUNDWATER THROUGH THE USE OF EXTRACTION AND TREATMENT METHODS. SLUDGE RESULTING FROM THE TREATMENT FOR METALS REMOVAL WOULD BE DISPOSED OF OFF SITE, AND SPENT CARBON FROM THE REMOVAL OF VOCs WOULD BE REGENERATED OR DISPOSED OF OFF SITE. IT IS ANTICIPATED THAT, AT THE CONCLUSION OF THE REMEDIAL ACTION, THE GROUNDWATER QUALITY WILL BE WITHIN MCLS. THE TREATMENT PROVIDED UNDER BOTH OF THESE ALTERNATIVES WOULD BE IRREVERSIBLE.

THE TOXICITY OF CONTAMINANTS FOR ALTERNATIVE 3A, AT THE RONE REALTY INDUSTRIAL AREA PLUME, WOULD BE REDUCED BY FLUSHING AND NATURAL ATTENUATION PROCESSES.

SHORT-TERM EFFECTIVENESS

THIS CRITERION CONSIDERS THE PERIOD OF TIME NEEDED TO ACHIEVE PROTECTION AND ANY ADVERSE IMPACTS ON HUMAN HEALTH AND THE ENVIRONMENT THAT MAY BE POSED DURING THE CONSTRUCTION AND IMPLEMENTATION PERIOD UNTIL CLEANUP GOALS ARE ACHIEVED.

THE MAJOR RISK ASSOCIATED WITH THE CONTAMINATED GROUNDWATER IS THE USE OF IT FOR POTABLE PURPOSES. A GAC FILTRATION SYSTEM WAS INSTALLED ON THE BOROUGH'S MUNICIPAL WATER SUPPLY SYSTEM IN JULY 1981. THEREFORE, THAT RISK HAS ALREADY BEEN SIGNIFICANTLY REDUCED.

NEITHER ALTERNATIVE 2 OR 3 WOULD CREATE ANY SIGNIFICANT SHORT-TERM, HEALTH-RELATED CONCERNS FOR THE PUBLIC BEYOND THOSE ASSOCIATED WITH NORMAL CONSTRUCTION ACTIVITIES. INCREASED TRAFFIC DURING CONSTRUCTION AND TRANSPORTATION OF TREATMENT RESIDUALS IS EXPECTED.

THE REMEDY DOES PRESENT A SLIGHT RISK INCREASE RESULTING FROM EMISSIONS; HOWEVER, THESE CAN BE MINIMIZED THROUGH CAREFUL MANAGEMENT OF THE TREATMENT UNIT.

THE REMEDY WOULD BE DESIGNED TO PREVENT ADVERSE IMPACTS TO THE BOROUGH'S WELLS. AN ASSESSMENT WOULD BE MADE DURING THE DESIGN OF THE REMEDY TO ENSURE THAT ANY ADVERSE IMPACTS TO WETLAND AREAS WOULD ALSO BE MITIGATED. IF APPROPRIATE, SOME OF THE TREATED GROUNDWATER COULD BE DISCHARGED TO WETLAND AREAS TO HELP OFFSET ANY DEWATERING EFFECTS CREATED BY GROUNDWATER EXTRACTION. IT IS BELIEVED THAT REINJECTING THE TREATED WATER WILL MINIMIZE ADVERSE IMPACTS.

IMPLEMENTABILITY

THIS CRITERION EXAMINES THE TECHNICAL AND ADMINISTRATIVE FEASIBILITY OF A REMEDY, INCLUDING AVAILABILITY OF MATERIALS AND SERVICES NEEDED TO IMPLEMENT THE CHOSEN SOLUTION.

ALTERNATIVES 2 AND 3 BOTH RELY ON TECHNICALLY FEASIBLE AND RELIABLE TREATMENT PROCESSES TO ACTIVELY RESTORE GROUNDWATER QUALITY. EXTRACTION AND TREATMENT SYSTEMS ARE RELATIVELY EASILY DESIGNED AND CONSTRUCTED. THE TREATMENT UNITS DESCRIBED IN ALTERNATIVES 2 AND 3 ARE READILY AVAILABLE, AND CAN BE EASILY OPERATED AND MAINTAINED. A PILOT-SCALE TREATABILITY STUDY WOULD BE REQUIRED TO ESTABLISH OPERATING PARAMETERS FOR UV PHOTOLYSIS AS A TREATMENT OPTION. THE REINJECTION OF TREATED GROUNDWATER SHOULD BE RELATIVELY EASILY IMPLEMENTED, AND WOULD AID IN THE FLUSHING OF CONTAMINATION FROM THE AQUIFER. SURFACE WATER DISCHARGE SHOULD ALSO BE RELATIVELY EASILY IMPLEMENTED, HOWEVER, IT WOULD NOT INFLUENCE THE MOVEMENT OF GROUNDWATER AND ENHANCE THE FLUSHING OF CONTAMINANTS FROM THE AQUIFER.

ALTERNATIVES 2 AND 3 HAVE FEW ASSOCIATED ADMINISTRATIVE DIFFICULTIES WHICH COULD DELAY IMPLEMENTATION. THE TECHNOLOGIES HAVE BEEN USED SUCCESSFULLY TO ADDRESS SIMILAR CONTAMINANTS AT OTHER SUPERFUND SITES, AND SKILLED WORKERS NEEDED TO IMPLEMENT THE REMEDIES ARE READILY AVAILABLE IN THE AREA.

SUFFICIENT LAND IS AVAILABLE TO BUILD THE TREATMENT PLANTS REQUIRED FOR ANY OF THE ALTERNATIVES WITHIN THE EXISTING BOUNDARIES OF THE ROCKAWAY BOROUGH WELL FIELD SITE. INSTALLATION OF THE EXTRACTION AND INJECTION WELLS AND THEIR ASSOCIATED PIPING MAY HAVE TO TAKE PLACE ON PRIVATE PROPERTIES AND MAY BE EXPECTED TO REQUIRE SOME ADMINISTRATIVE AND LEGAL EFFORTS.

COST

COSTS ARE EVALUATED IN TERMS OF REMEDIAL ACTION CAPITAL COSTS, OPERATION AND MAINTENANCE COSTS, AND PRESENT WORTH.

THE MAJOR COST DIFFERENCES BETWEEN THE ALTERNATIVES DEPENDS ON THEIR CLASSIFICATION. THE NO FURTHER ACTION ALTERNATIVE IS THE LEAST EXPENSIVE WITH AN ESTIMATED PRESENT WORTH OF \$27,000. THE ESTIMATED PRESENT WORTH FOR THE SEPARATE REMEDIATION OF PLUMES RANGES FROM \$19,546,000 TO \$20,888,000, WHEREAS, FOR THE COMBINED REMEDIATION OF THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES WITH NO FURTHER ACTION AT THE RONEO REALTY INDUSTRIAL AREA, IT VARIES BETWEEN \$15,898,000 AND \$17,818,000. IF REMEDIATION OF THE RONEO REALTY INDUSTRIAL AREA PLUME IS INCLUDED AS IN ALTERNATIVE 3B, THE ESTIMATED PRESENT WORTH RANGES FROM \$18,177,000 TO \$19,441,000. THE PREFERRED ALTERNATIVE, 3A(1), HAS AN ESTIMATED PRESENT WORTH OF \$17,818,000. TABLE 10 SHOWS THE SUMMARY OF COSTS.

STATE ACCEPTANCE

THE STATE ACCEPTANCE FACTOR ADDRESSES WHETHER THE STATE OF NEW JERSEY SUPPORTS, OPPOSES, OR HAS NO COMMENT ON THE PREFERRED ALTERNATIVE.

THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION AND ENERGY HAS CONDITIONALLY CONCURRED WITH THE SELECTED REMEDY. THE DEPARTMENT HAS RAISED SOME ISSUES RELATIVE TO THE ATTAINMENT OF MCL GOALS AND THE CONSIDERATION OF OTHER ALTERNATIVES. IT HAS ALSO QUESTIONED THE EFFECTIVENESS OF MOVING AHEAD WITH A GROUNDWATER REMEDY WITHOUT ADDRESSING THE SOURCES.

THE RECORD OF DECISION CLEARLY INDICATES THAT SUBSEQUENT SOURCE INVESTIGATIONS WILL BE NECESSARY TO BETTER CHARACTERIZE ANY CONTINUING SOURCES OF CONTAMINATION AS WELL AS TO DETERMINE THE NEED FOR REMEDIATION OF SUCH CONTAMINATION. IT ALSO INDICATES THAT THE MCL GOAL MAY BE REEVALUATED BASED ON OPERATING EXPERIENCE WITH THE REMEDIAL SYSTEM. IN ADDITION, THE ROD COMMITS TO EVALUATING REASONABLE APPROACHES TO ENSURE THAT THE BOROUGH'S WATER SUPPLY SYSTEM AND OUR EXTRACTION AND TREATMENT SYSTEM OPERATE IN A COMPLIMENTARY AND EFFICIENT MANNER.

CONTRARY TO THE STATE'S POSITION, EPA CONSIDERED APPROPRIATE REMEDIAL ALTERNATIVES TO ADDRESS THE GROUNDWATER CONTAMINATION AND FIRMLY BELIEVES THAT THE SELECTED REMEDY WILL BE SUCCESSFUL IN ACHIEVING CLEANUP GOALS AND CAN BE PERFORMED IN A COST-EFFECTIVE MANNER. THEREFORE, EPA IS NOT MAKING A COMMITMENT TO AMEND THE ROD AT A LATER DATE.

COMMUNITY ACCEPTANCE

THIS EVALUATION FACTOR ADDRESSES PUBLIC REACTION TO THE REMEDIAL ALTERNATIVES WHICH WERE CONSIDERED, AND THE

PREFERRED ALTERNATIVE.

ISSUES RAISED DURING THE PUBLIC COMMENT PERIOD AND AT THE PUBLIC MEETING HELD ON AUGUST 12, 1991, ARE ADDRESSED IN THE RESPONSIVENESS SUMMARY SECTION OF THIS ROD. UPON REVIEW OF THESE COMMENTS, EPA HAS DETERMINED THAT NO SIGNIFICANT CHANGES TO THE REMEDY, AS IT WAS ORIGINALLY IDENTIFIED IN THE PROPOSED PLAN, WERE NECESSARY.

#SR

SELECTED REMEDY

SECTION 121(B) OF CERCLA, AS AMENDED, REQUIRES EPA TO SELECT REMEDIAL ACTIONS WHICH UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES OR RESOURCE RECOVERY OPTIONS TO THE MAXIMUM EXTENT PRACTICABLE. IN ADDITION, EPA PREFERS REMEDIAL ACTIONS THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE MOBILITY, TOXICITY, OR VOLUME OF SITE WASTES.

AFTER CAREFUL REVIEW AND EVALUATION OF THE ALTERNATIVES EVALUATED IN DETAIL IN THE FEASIBILITY STUDY, AND CONSIDERATION OF ALL EVALUATION CRITERIA, EPA PRESENTED ALTERNATIVE 3, OPTION A(1), COMBINED REMEDIATION AT THE KLOCKNER AND KLOCKNER AND WALL STREET/EAST MAIN STREET PLUMES WITH NO FURTHER ACTION AT THE ROND REALTY INDUSTRIAL AREA. THIS ALTERNATIVE INCLUDES GROUNDWATER EXTRACTION, TREATMENT BY CHEMICAL PRECIPITATION AND AIR STRIPPING, REINJECTION OF TREATED GROUNDWATER, AND A PERFORMANCE MONITORING PROGRAM.

THE INPUT RECEIVED DURING THE PUBLIC COMMENT PERIOD, CONSISTING PRIMARILY OF QUESTIONS AND STATEMENTS SUBMITTED AT THE PUBLIC MEETING HELD ON AUGUST 12, 1991, AND WRITTEN COMMENTS, IS PRESENTED IN THE ATTACHED RESPONSIVENESS SUMMARY. PUBLIC COMMENTS ENCOMPASSED A RANGE OF ISSUES, BUT DID NOT NECESSITATE ANY MAJOR CHANGES IN THE PREFERRED ALTERNATIVE FOR THE SITE. ACCORDINGLY, THE PREFERRED ALTERNATIVE HAS BEEN SELECTED BY EPA AS THE REMEDIAL SOLUTION FOR THE SITE.

THE SELECTED REMEDY ADDRESSES ONLY THE CONTAMINATED GROUNDWATER. ADDITIONAL INVESTIGATIONS TO FURTHER DELINEATE THE EXTENT OF THE SOURCES OF THE GROUNDWATER CONTAMINATION WILL BE NECESSARY.

THE GOAL OF THE REMEDIAL ACTION AT THE ROCKAWAY BOROUGH WELL FIELD SITE IS TO RESTORE THE GROUNDWATER TO MCLS. BASED ON INFORMATION OBTAINED DURING THE REMEDIAL INVESTIGATION AND ON A CAREFUL ANALYSIS OF THE REMEDIAL ALTERNATIVES, IT IS ANTICIPATED THAT THE SELECTED REMEDY WILL ACHIEVE THIS GOAL. HOWEVER, STUDIES SUGGEST THAT GROUNDWATER EXTRACTION AND TREATMENT REMEDIES ARE NOT ALWAYS COMPLETELY SUCCESSFUL IN REDUCING CONTAMINANTS TO HEALTH-BASED LEVELS IN AN AQUIFER. ACTUAL OPERATION OF THE REMEDIAL SYSTEM MAY INDICATE THE TECHNICAL IMPRACTICABILITY OF REACHING HEALTH-BASED WATER QUALITY STANDARDS USING THIS APPROACH. IF, DURING THE IMPLEMENTATION OF THE REMEDY, IT BECOMES APPARENT THAT CONTAMINANT LEVELS HAVE CEASED TO DECLINE AND ARE REMAINING RELATIVELY CONSTANT AT LEVELS HIGHER THAN THE REMEDIAL GOAL, OR THAT IT IS NO LONGER COST-BENEFICIAL TO OPERATE THE REMEDIAL SYSTEM, THAN THE REMEDIAL GOAL AND THE REMEDY ITSELF MAY BE REEVALUATED.

UNDER THE ABOVE SCENARIO, IT IS LIKELY THAT OPERATION OF THE REMEDIAL EXTRACTION WELLS AND TREATMENT SYSTEM WOULD BE SUSPENDED. THE BOROUGH WOULD THEN NEED TO CONTINUE OPERATING ITS SYSTEM TO TREAT THE LEVELS OF CONTAMINATION REMAINING IN THE GROUNDWATER PRIOR TO DISTRIBUTION FOR POTABLE USE.

SINCE THE BOROUGH'S WATER SUPPLY SYSTEM IS EXTRACTING A PORTION OF THE CONTAMINATED GROUNDWATER, CONTINUED OPERATION OF THE SYSTEM HAS A BENEFICIAL EFFECT ON GROUNDWATER QUALITY. THEREFORE, DURING DESIGN OF THE SELECTED REMEDY, EPA WILL EXPLORE WAYS TO INTEGRATE THE WATER SUPPLY AND REMEDIAL SYSTEMS TO MAXIMIZE THEIR COMBINED EFFECTIVENESS.

THE SELECTED REMEDY WILL INCLUDE GROUNDWATER EXTRACTION FOR AN ESTIMATED PERIOD OF 27 YEARS, DURING WHICH THE REMEDIAL SYSTEM'S PERFORMANCE WILL BE CAREFULLY MONITORED ON A REGULAR BASIS AND ADJUSTED AS WARRANTED BY THE PERFORMANCE DATA COLLECTED DURING OPERATION. MODIFICATIONS MAY INCLUDE, BUT NOT BE LIMITED TO:

A) ALTERNATING PUMPING AT WELLS TO ELIMINATE STAGNATION POINTS; AND

B) PULSE-PUMPING TO ALLOW AQUIFER EQUILIBRATION AND TO ENCOURAGE ADSORBED CONTAMINANTS TO PARTITION INTO THE

GROUNDWATER.

SOME ADDITIONAL ACTIVITIES WILL BE PERFORMED DURING THE REMEDIAL DESIGN AND REMEDIAL ACTION PHASES FOR THE SITE. THESE ACTIVITIES ARE DESCRIBED BELOW.

THE AQUIFERS WILL BE PERIODICALLY MONITORED DURING THE REMEDIAL DESIGN AND REMEDIAL ACTION PHASES, AS WELL AS FOLLOWING THE COMPLETION OF THE REMEDIAL ACTION. DURING THE REMEDIAL DESIGN, STUDIES WILL BE UNDERTAKEN TO FURTHER DELINEATE THE EXTENT OF CONTAMINATION AND GROUNDWATER FLOW PATTERNS, AND TO DETERMINE IF THE REMEDIATION OF THE GROUNDWATER CONTAMINATION CAN BE ACCELERATED BY OPTIMIZING THE EXTRACTION SYSTEM.

AN ASSESSMENT WILL BE MADE DURING THE REMEDIAL DESIGN TO ENSURE THAT ANY ADVERSE IMPACTS TO ANY WETLAND AREAS WILL BE MITIGATED. IF APPROPRIATE, SOME OF THE TREATED GROUNDWATER COULD BE DISCHARGED TO WETLAND AREAS TO HELP OFFSET ANY DEWATERING EFFECTS CREATED BY THE GROUNDWATER EXTRACTION.

A CULTURAL RESOURCES SURVEY WILL BE PREPARED TO ENSURE COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT.

#SD

STATUTORY DETERMINATIONS

SUPERFUND REMEDY SELECTION IS BASED ON CERCLA, AS AMENDED, AND THE REGULATIONS CONTAINED IN THE NCP. EPA'S PRIMARY RESPONSIBILITY AT SUPERFUND SITES IS TO UNDERTAKE REMEDIAL ACTIONS THAT ACHIEVE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT. ADDITIONALLY, SEVERAL OTHER STATUTORY REQUIREMENTS AND PREFERENCES HAVE BEEN ESTABLISHED. THESE SPECIFY THAT, WHEN COMPLETE, THE SELECTED REMEDY MUST COMPLY WITH ARARS, UNLESS A STATUTORY WAIVER IS JUSTIFIED. THE REMEDY MUST ALSO BE COST EFFECTIVE AND UTILIZE PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE. FINALLY, THERE IS A PREFERENCE FOR REMEDIES WHICH EMPLOY TREATMENT THAT PERMANENTLY AND SIGNIFICANTLY REDUCE THE TOXICITY, MOBILITY, OR VOLUME OF HAZARDOUS WASTES AS THEIR PRINCIPAL ELEMENT. THE FOLLOWING SECTIONS DISCUSS HOW THE REMEDY SELECTED FOR THE ROCKAWAY BOROUGH WELL FIELD SITE MEETS THESE REQUIREMENTS AND PREFERENCES.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

THE SELECTED REMEDY PROTECTS HUMAN HEALTH AND THE ENVIRONMENT THROUGH THE EXTRACTION AND TREATMENT OF CONTAMINATED GROUNDWATER.

THE EXTRACTION AND TREATMENT OF THE CONTAMINATED GROUNDWATER WILL SIGNIFICANTLY REDUCE THE THREAT OF POTENTIAL EXPOSURE TO CONTAMINATED GROUNDWATER. THE POTENTIAL RISK, ESTIMATED UNDER A FUTURE USE SCENARIO IN THE PHE, IS $2 \times (10^{-3})$. THE REMEDY, UPON COMPLETION, WILL RESTORE THE AQUIFER TO THE MCLS. THEREFORE, HEALTH RISKS ASSOCIATED WITH THE GROUNDWATER CONTAMINATION RESULTING FROM THE SITE WILL BE REDUCED TO WITHIN THE ACCEPTABLE RANGE OF BETWEEN $1 \times (10^{-4})$ TO $1 \times (10^{-6})$ FOR CARCINOGENS, AND THE HAZARD INDICES FOR NONCARCINOGENS WILL BE LESS THAN ONE.

THERE ARE NO SHORT-TERM ADVERSE IMPACTS ASSOCIATED WITH THE SELECTED REMEDY WHICH CANNOT BE READILY CONTROLLED. WHILE NO CROSS-MEDIA IMPACTS ARE EXPECTED FROM THE REMEDY, ANY ENVIRONMENTAL IMPACTS ASSOCIATED WITH SITE RELATED CONTAMINANTS OR REMEDIAL ACTIVITIES WILL BE ADDRESSED IN THE REMEDIAL DESIGN.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

THE SELECTED REMEDY WILL COMPLY WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE ACTION-, CONTAMINANT-, AND LOCATION-SPECIFIC REQUIREMENTS. THE ARARS ARE PRESENTED BELOW.

ACTION-SPECIFIC

THE SELECTED REMEDY WILL BE IN COMPLIANCE WITH ALL FEDERAL AND STATE ARARS. THE CLEANUP GOALS FOR THE REMEDIATION OF THE GROUNDWATER ARE THE MORE STRINGENT OF THE STATE AND FEDERAL MCLS WHICH ARE STANDARDS FOR DRINKING WATER.

EMISSIONS FROM THE TREATMENT UNIT WOULD CONFORM WITH THE PROVISIONS OF THE CLEAN AIR ACT. THIS WILL BE ACCOMPLISHED THROUGH THE INSTALLATION OF APPROPRIATE AIR POLLUTION CONTROL EQUIPMENT IF NECESSARY. SLUDGE FROM CHEMICAL PRECIPITATION WOULD BE DISPOSED OF ACCORDING TO RCRA REQUIREMENTS. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION REQUIREMENTS WOULD BE COMPLIED WITH DURING THE IMPLEMENTATION OF THE REMEDY.

WITH RESPECT TO STATE ACTION-SPECIFIC ARARS, THE AIR STRIPPER AND ANY OTHER REGULATED EQUIPMENT WILL BE DESIGNED, CONSTRUCTED, AND OPERATED TO MEET THE AIR POLLUTION CONTROL AND THE NOISE POLLUTION CONTROL ACT REQUIREMENTS AND REGULATIONS.

CHEMICAL-SPECIFIC

THE MORE STRINGENT OF THE STATE AND FEDERAL MCLS WILL BE USED AS CLEANUP GOALS FOR THE GROUNDWATER REMEDIATION.

LOCATION-SPECIFIC

THE SITE IS NOT WITHIN THE COASTAL ZONE AS DEFINED BY THE STATE OF NEW JERSEY. ADDITIONALLY, THERE ARE NO FEDERALLY DESIGNATED WILD AND SCENIC RIVERS AND THERE ARE NO SIGNIFICANT AGRICULTURAL LANDS IN THE VICINITY OF THE SITE. THE PROJECT AREA MAY BE SENSITIVE FOR THE DISCOVERY OF CULTURAL RESOURCES. THEREFORE, AS DISCUSSED EARLIER, A CULTURAL RESOURCES SURVEY WILL BE PREPARED DURING REMEDIAL DESIGN. ADDITIONALLY, A WETLANDS ASSESSMENT WILL BE PERFORMED AT THAT TIME TO DETERMINE THE PRESENCE OF AND POTENTIAL IMPACTS ON WETLAND AREAS. IF THE REMEDIAL ACTION TAKES PLACE IN A FLOODPLAIN, OR WILL RESULT IN CHANGES TO FLOODING LEVELS, A FLOODPLAINS ASSESSMENT WILL BE CONDUCTED DURING THE DESIGN PHASE.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

EPA HAS DETERMINED THAT THE SELECTED REMEDY REPRESENTS THE MAXIMUM EXTENT TO WHICH PERMANENT SOLUTIONS AND TREATMENT TECHNOLOGIES CAN BE UTILIZED IN A COST-EFFECTIVE MANNER FOR THE ROCKAWAY BOROUGH WELL FIELD SITE. OF THE ALTERNATIVES THAT ARE PROTECTIVE OF HUMAN HEALTH AND THE ENVIRONMENT, AND COMPLY WITH ARARS, EPA HAS DETERMINED THAT THE SELECTED REMEDY PROVIDES THE BEST BALANCE OF TRADEOFFS IN TERMS OF LONG-TERM EFFECTIVENESS AND PERMANENCE, REDUCTION IN TOXICITY, MOBILITY, OR VOLUME ACHIEVED THROUGH TREATMENT, SHORT-TERM EFFECTIVENESS, IMPLEMENTABILITY, COST, AND COMMUNITY ACCEPTANCE.

ALTERNATIVE 2 REDUCES THE TOXICITY, MOBILITY, AND VOLUME OF THE CONTAMINANTS IN THE GROUNDWATER; COMPLIES WITH ARARS; PROVIDES BOTH SHORT-TERM AND LONG-TERM EFFECTIVENESS; AND PROTECTS HUMAN HEALTH AND THE ENVIRONMENT EQUALLY AS WELL AS ALTERNATIVE 3. THE COSTS FOR BOTH OF THE ALTERNATIVES ARE ALSO RELATIVELY CLOSE. HOWEVER, ALTERNATIVE 3 MAY BE MORE EASILY IMPLEMENTED THAN ALTERNATIVE 2. THEREFORE, THE SELECTED REMEDY IS DETERMINED TO BE THE MOST APPROPRIATE SOLUTION FOR THE CONTAMINATED GROUNDWATER AT THE ROCKAWAY BOROUGH WELL FIELD SITE.

COST EFFECTIVENESS

THE SELECTED ALTERNATIVE IS DETERMINED TO BE COST EFFECTIVE BECAUSE IT PROVIDES THE HIGHEST DEGREE OF PROTECTIVENESS AMONG THE ALTERNATIVES EVALUATED AT REASONABLE COST.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

BY EXTRACTING AND TREATING THE CONTAMINATED GROUNDWATER, THE SELECTED REMEDY ADDRESSES THE THREATS POSED BY THE SITE THROUGH THE USE OF TREATMENT TECHNOLOGIES. THEREFORE, THE STATUTORY PREFERENCE FOR REMEDIES THAT EMPLOY TREATMENT AS A PRINCIPAL ELEMENT IS SATISFIED BY THE SELECTED REMEDY.